

## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Application of:

Wei William Wu et al.

Serial No.: 09/874,098

Filed: June 4, 2001

For: METHOD AND APPARATUS TO  
FACILITATE INDEPENDENT  
PROTECTION SWITCHING IN A  
DISTRIBUTED NETWORK

Examiner: Sam. Phirin

Art Unit: 2661

Confirmation No.: 6034

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 Commissioner for Patents  
 PO Box 1450  
 Alexandria, VA 22313-1450

DECLARATION OF PRIOR INVENTION IN THE UNITED STATES TO  
OVERTCOME CITED PATENT OR PUBLICATION (37 C.F.R. §1.131)

Sir:

My name is Wei William Wu. I am currently an employee at Turin Networks of Petaluma, California, which is an assignee of the present invention as claimed.

I am an inventor of the above-identified patent application. The declaration made herein is to establish a completion of the invention as claimed in the application in the United States at a date at least prior to May 10, 2001, which is the filing date of U.S. Patent No. 6,608,836 of Mao et al. ("Mao"), which has been assigned to a common assignee of the present application. I hereby declare that I have reviewed the application, including the claims of the application and that my invention as claimed was conceived at least by May 10, 2001.

I conceived the claimed invention in the United States prior to May 10, 2001 and worked with due diligence from prior to May 10, 2001 to the filing date of the present application.

Embodiments of my invention are related to independent protection switching in a distributed network. A project involving embodiments of the invention began at least by January 2001. I prepared a document that depicts the invention as claimed and a copy of which is enclosed as Exhibit A attached.

In addition, as a part of continuous due diligence, I worked with my patent attorney, Thomas M. Coester from Blakely et al. to prepare filing the present application. In February 2001, I received a draft of the present application from my patent attorney. Exhibit B attached herewith is a copy of the letter sent with the draft of the present application.

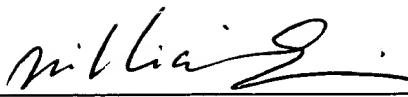
Since then I had reviewed and provided comments to several drafts of the present applications. On June 4, 2001, I provided comments on the final draft of the present application, which was filed June 4, 2001.

Continuous due diligence, as part of this project, was employed in reducing the claimed invention to practice. At least one person was working, as part of this due diligence, on the creation of the software and/or hardware, which embodied the claimed invention prior to May 10, 2001, until the present application was filed June 4, 2001.

Based on the above description and as is evident from the attached exhibits, the conception of the subject matter described and claimed in the present application occurred prior to May 10, 2001, and there was continuous due diligence, in writing and testing, from at least prior to May 10, 2001 until the present application was filed June 4, 2001.

As the below-signed inventor, I, Wei William Wu, hereby declare that all statements herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements are made knowing that willful false statements and the like are punishable by fine or imprisonment, or both under §1001 of Title 18 of U.S.C., and such willful or false statements may jeopardize the validity of the application or any patent issuing therefrom.

Date: oct. 04, 2005



Signature

Full Legal Name: Wei William Wu

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# TURIN NETWORKS, Inc.

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## ***Innovative logical SONET Switch Control***

*Revision <1.0>*

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USA

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## 1 Introduction

This document provides a high level, short introduction to the challenges and solution to supporting all different SONET APS functions in a distributed switch architecture.

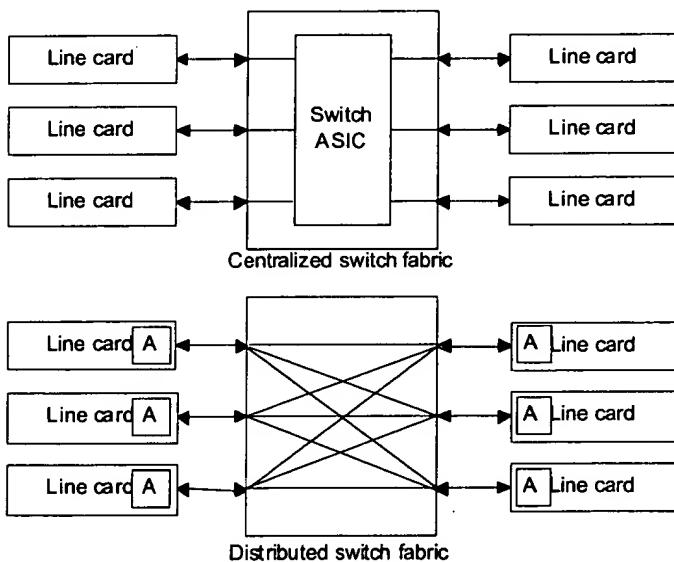
## 2 Centralized vs. Distributed switch

To start the discussion about the solution for the distributed switch the term “distributed” needs to be defined. In our case we differentiate between two solutions:

“Centralized” : All switching takes place in one physical location, often a single ASIC. Often the backplane (or separate card) contains the switching ASIC(s) and is referred to as the “switching fabric”. The fabric needs to be duplicated to provide protection against equipment failure in the backplane/switch-fabric.

“Distributed” : The switching is taken place at several different physical locations. Together they implement the same functions as a centralized switch. Often the physical backplane is passive and the redundancy is not needed for equipment failure protection.

There are several pros and cons with both solutions and one cannot be said to be superior than the other.



**Figure 1. Illustration of the “centralized” and “distributed” approach.**

This document will only describe the distributed approach, especially when the fabric is a passive full mesh (i.e. all line cards has a dedicated link to all other cards).

## 3 Problems

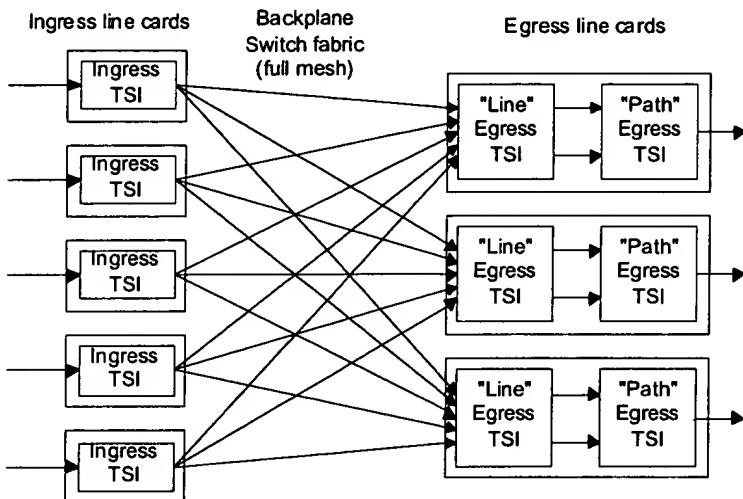
The problems with the distributed switch (full mesh) is that the traffic always goes directly to the destination. There is not any point in the system where the traffic

is aggregated and concentrated except for the entry and exit point. The ideal place to do the protection switching is a place in the system where the traffic always pass through. In the full mesh no such place exists and therefore the switching logic needs to be distributed.

## 4 Solution

Turin Networks solution identifies the problem and solve the switch distribution in the full mesh by the following methods:

- Bridging of traffic in the ingress Time Slot Interchange (TSI) to all possible protection paths
- A first “line-level” egress TSI with support for multiple APS standards
- A second “path-level” egress TSI for all path switching
- A flexible control data flow enabling a flexible protection group assignment

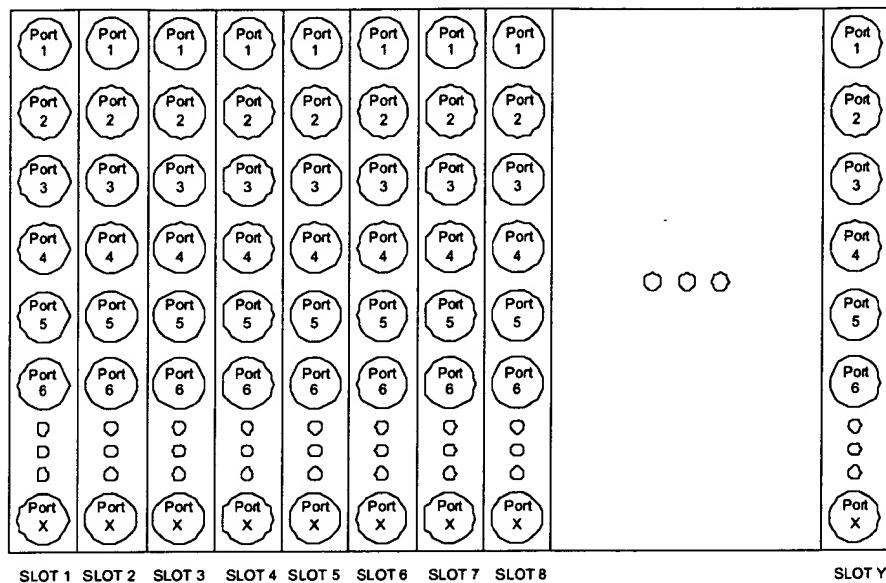


**Figure 2. Overview of the building blocks. The data flows from left to right in the figure (All line cards will have both the ingress and egress switching blocks but they are left out in the picture).**

It is also important to see the benefits that this implementation creates. Consider the network box in Figure 3. Turin networks implementation of the backplane and backplane circuit could make it possible to support configurations like (slot # - port #):

- 1+1 with (1-1) as working and (2-3) as protection
- 1:1 with (1-2) as working and (5-1) as protection
- 1:5 with (2-1), (2-2), (3-2), (1-3), and (1-4) as working and (1-5) as protect
- 2-UPSR with (1-6) and (7-8)
- 2-BLSR with (1-7) and (1-8)

This is just to give an idea of the possibilities. The solution is requiring both software and hardware. In this document the focus is on the hardware.



**Figure 3.** “Typical” network box. Each slot could be equipped with a line card. Each line card could be equipped with one or more optical ports.

#### 4.1 Bridging

If we look at the ingress traffic on a line card that has one or more ports that are part of a protection group we can make some reflections to the requirements for most flexible solution.

- One or more of the ports can be in the protection group
- One or more of the other ports on the line card can be members of (an)other protection group(s)
- The rest of the ports in the protection group can be any ports on any cards in the system.

The incoming traffic is setup to be bridged by the ingress TSI to all other cards (ports) where protection group members are present.

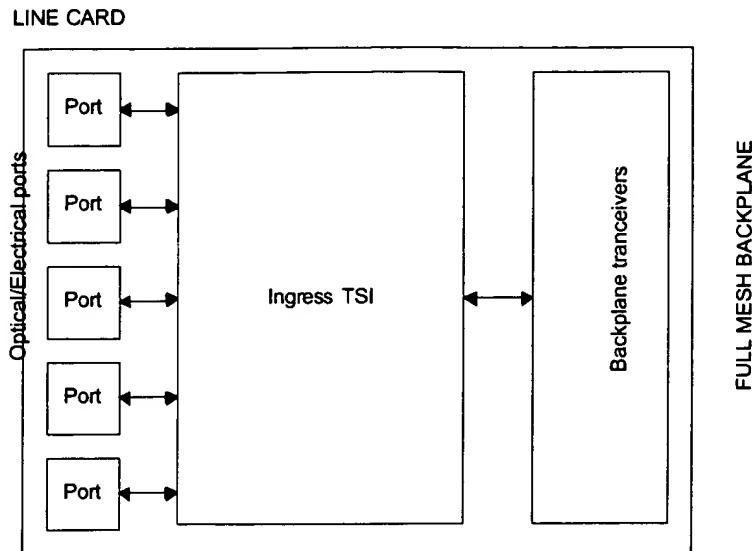
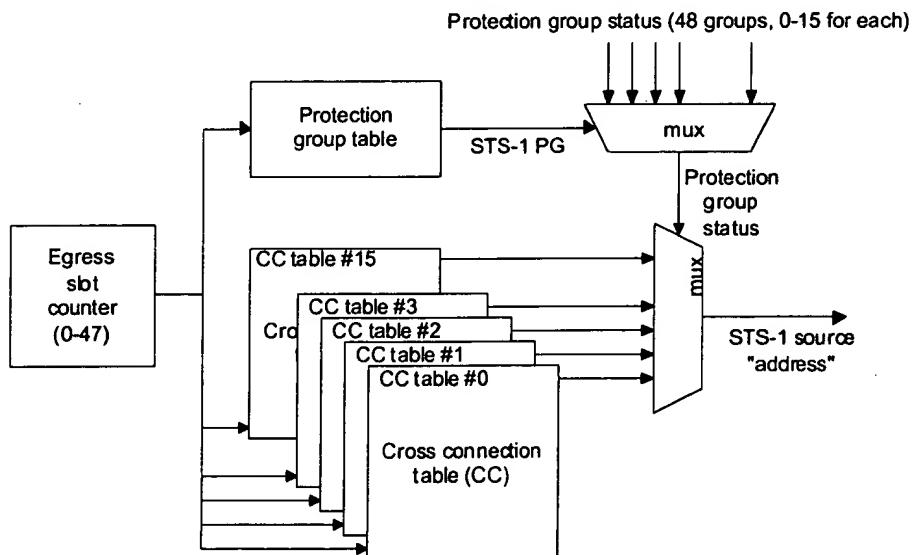


Figure 4. Schematic view of ingress TSI.

#### 4.2 "Line" switching

The first TSI on the egress data path takes in all the traffic from the full mesh. I.e. it can switch from all different cards and ports to two outputs. The two outputs are needed for the "path-level" switch described in the next section. The TSI is setup through connection tables. The connection tables tell which incoming slot on which incoming link goes on each outgoing slot. There will be several cross connect tables that are used for the protection switch. The table will also be dynamically assigned to protection groups. In this way each outgoing slot will have several possible sources (from different links and different slots) and the selection of which slot/link to use for an outgoing slot is done through a status of the protection group. This selection is illustrated in Figure 5.

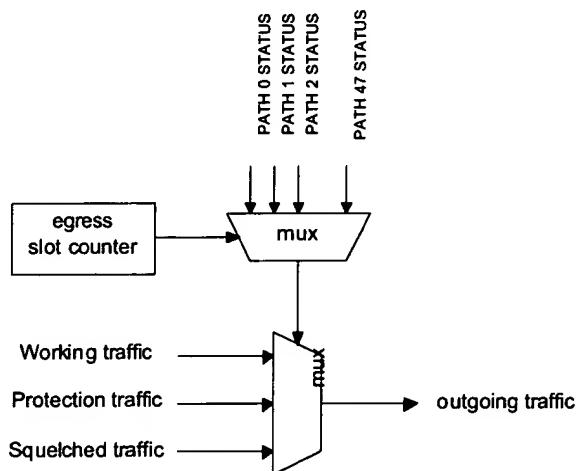


**Figure 5. Egress TSI 1 source STS-1 look-up logic.** The egress slot counter is running synchronously with the egress data. The current slot is used for reading out from all tables. The read out PG is then used to “look-up” the status for that group. The status for the group will then be used to index into the 16 cross connection tables.

The status for the different protection groups is communicated on the backplane. The assignment to a specific protection group is done dynamically through software.

#### 4.3 “Path” switching

After the first egress TSI block there is a second block that will perform path switching. This block needs to be after the first because the first block collects all paths from the distributed switch. We need to collect paths for both the working and protection traffic, thus the first TSI will output two traffic flows. The information of the status of the paths are communicated on the backplane. This block will also be able to squelch, insert path AIS, the traffic configured by the SW.



**Figure 6. Schematic overview of the second egress switching block.**

### 5 Innovations

The document is not giving a full explanation of neither the implementation nor the problems it solves. The purpose is only to give an idea of the possible innovations. I could imagine that the following “head lines” could be possible to get patents on:

- “APS hardware support for 1:N SONET configurations in a full mesh backplane switch implementation”
- “SONET line protection switching in a full mesh distributed switch”
- “SONET path protection switching in a full mesh distributed switch”
- “SONET protection group control in a distribute full mesh switch backplane”
- “Combined SONET STS-1 cross connect and protection switching function in a distributed switch”

- “Centralized APS control scheme in a distributed switch”

The bullets are only given to give an idea of what might be considered unique.  
When working out the details some bullets might describe the same idea.

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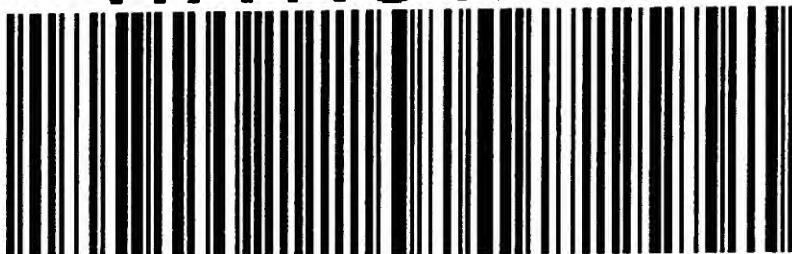
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February 26, 2001

**ATTORNEY-CLIENT PRIVILEGED  
CONFIDENTIAL COMMUNICATION**

**VIA FEDERAL EXPRESS**

William Wei Wu  
TURIN NETWORKS  
1415 North McDowell Blvd.  
Petaluma, CA 94954

Re: U.S. Patent Application for:  
**METHOD AND APPARATUS TO FACILITATE INDEPENDENT  
PROTECTION SWITCHING IN A DISTRIBUTED NETWORK**  
Our File No.: 005043.P010

Dear William:

Enclosed is an initial draft of the United States Patent Application for the above-noted invention for your review and review by the other inventors. If you would like, I can provide the document in electronic form. Please carefully review the application and associated drawings (Figures 1 – 4 attached hereto) and have the other inventors do the same. As you can see there are a number of holes in the draft, please call me (or have one of your co-inventors call me) to discuss additions needed to complete the application. In this connection, please see the enclosed document entitled "Important Information Which Must Be Considered Prior To Filing A Patent Application In The United States" for information on the inventorship and other issues.

During your review, please bear in mind that the description of the invention should be in sufficient detail such that a person skilled in the field of the invention can make and use the invention without undue experimentation. If you have any questions concerning this point, please do not hesitate to call. Another requirement necessary to obtain a valid patent is that the best mode known to the inventor for

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William Wei Wu  
TURIN NETWORKS  
February 26, 2001  
Page 2

practicing the invention must be included in the description of the invention. Again, do not hesitate to call if you have any questions on this point. The enclosed document contains further information on these points.

It is my understanding that the invention has not been patented or described in a printed publication in this or a foreign country, or in public use or on sale in this country, more than one year prior to the date the application is to be filed. Please let me know as soon as possible if you believe otherwise.

Once your review is complete, I look forward to receiving your comments and recommendations for changes and additions to this application.

If you have any questions regarding the application or any of the points in this letter, please call me at your earliest convenience.

Best personal regards,

BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN



Thomas M. Coester

Enclosures

TMC/kkr

## **IMPORTANT INFORMATION WHICH MUST BE CONSIDERED PRIOR TO FILING A PATENT APPLICATION IN THE UNITED STATES**

A patent may be obtained for methods, systems, apparatus and materials that are, among other things, novel and non-obvious. Since a determination has already been made that it is worthwhile to pursue patent protection, the following sets forth several requirements which are necessary to secure a valid patent in the United States and elsewhere. That is, even if the invention is novel and non-obvious and a patent is obtained, the validity of the patent can be challenged at a later date, and if found lacking in any of the areas discussed below, the patent could be invalidated in a legal proceeding brought by a third party. Although we discussed most, if not all, of the items set forth below, it is requested that you carefully review this advisory to ensure you understand the various requirements and call me if you have any questions at all.

### **INVENTORSHIP**

To secure a valid patent, all persons who invented the subject matter being claimed must be identified by their correct legal names. It is equally important to ensure that the list of inventors does not include anyone who, in fact, is not an inventor. In general, a person is deemed to be an inventor if that person conceived the invention or was involved in the design of the invention. By way of example, if a person conceived the invention and produced a rough, but detailed sketch, that person would be an inventor. However, if the rough sketch were given to a draftsman who merely created a blueprint from the sketch without adding any substance, the draftsman would not be an inventor. Similarly, a technician who used the blueprint to create a working prototype would not be considered to be an inventor. On the other hand, if either the draftsman or technician uncovered defects in the original design as shown in the rough sketch and changed the original design, then such person would also be an inventor.

### **ENABLING DISCLOSURE AND BEST MODE**

The description of the invention must be in sufficient detail such that a person skilled in the field of the invention can make and use the invention without undue experimentation. Additionally, the best mode known to the inventor for practicing the invention must be included in the description of the invention. These points were previously discussed in detail with you.

### **DUTY OF DISCLOSURE**

All persons who are inventors of the subject matter of a patent application have a continuing duty to disclose to the Patent and Trademark Office information the inventors are aware of that is material to the examination of the patent application. Such information is material if it is not cumulative of information already made known to the Patent and Trademark Office, and it establishes by itself or in combination with other information a presumption that a claim is not patentable, or it refutes or is inconsistent with a position taken in arguing that a claim is patentable or opposing a position taken by the Patent and Trademark Office that a claim is not patentable. To ensure compliance with this requirement, if you are aware of any articles or any other information bearing on the invention, please bring them to my attention so that a determination can be made whether or not to make such information of record.

### **PRIOR OFFERS TO SELL, SALES AND USE OF THE INVENTION**

An inventor's own activities can cause the invention to lose its novelty. In this connection, a United States patent application must be filed within one year from the date the invention is first used in public or first offered for sale or sold in the United States, and within one year from the date of any printed publication describing the invention either in the United States or in any foreign country. Since some time may pass before the application is completed so that it can be filed, be sure to inform me of any activities which have already taken place so that steps can be taken to ensure that the application is filed within one year of any activities which may have caused the clock for the one year period to start running.

## FOREIGN FILING

A patent provides protection only in the country in which the application was filed. If you believe that protection in other countries may be desired, be sure to let me know as soon as possible. In this connection, while many of the requirements for patent protection in other countries are the same as in the United States, some requirements are not. The most important requirement for which the law may differ in other countries is that the one year "grace" period discussed above concerning publications and sales activities does not exist in many countries. It is not feasible to discuss the applicable law of other countries in this letter. However, what is important to recognize is that any sales or use activities or any publication prior to the United States filing date may create a bar to obtaining a valid patent in certain foreign countries. On the other hand, once the application has been filed in the United States, so long as the application is filed in foreign countries within one year of the U.S. filing date, use, sales and publications after the U.S. filing date may take place without affecting foreign patent rights in most, if not all, industrialized countries of the world.

This advisory does not attempt to set forth all requirements necessary to obtain a valid patent. The purpose of this advisory is to ensure that you are aware of the most frequently encountered problem areas. In this connection, if there is anything in this advisory that is not clear to you, or if you have any questions as to any of the items mentioned above, do not hesitate to contact me so that we can discuss the matter in further detail.